Cardiovascular System Worksheet

1) 3 Functions
- delivery of O_2, fuel and nutrients to the tissues and clearing the CO_2 and waste
- maintenance of body temp (thermoregulation)
- prevention of infection

2) Cardiac Cycle
- series of events that occur throughout a heart beat. Including relaxation (diastole) where the heart is filling with blood and the contraction of ventricles during systole
- dramatic changes in pressure
- Systolic Blood Pressure- refers to pressure in arteries during contraction 120mmHg
- Diastolic Blood Pressure- pressure observed during relaxation ie 80mmHg

120/80

Nov 4-6:32 AM

3) Arteries
- very thick walls
- carry blood *from* the heart
- very elastic
- recoil during diastole

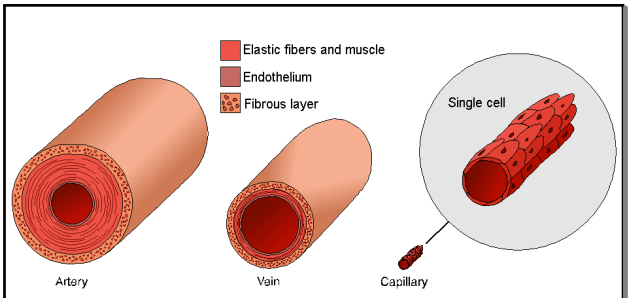
Arterioles
- smaller than arteries
- surrounded by rings of muscle
- contract to restrict, relax to allow blood flow
- governed by nerves & chemical release by tissue

Capillaries
- smallest vessels
- RBC barely fit through lumen
- very thin walls
- dense framework within tissues
- gases and nutrients are exchanged

Nov 4-6:48 AM

Veins
- blood return to the heart
- become larger toward heart
- small *venules* to *veins* to *vena cava*
- one way valves
- decreased blood pressure because **valves** work against gravity to move blood back to the heart (venous return)

Nov 4-6:55 AM



Blood vessels

4) Blood
Plasma
- fluid (water and dissolved substances)
- 55%

Blood Cells
- 45%
- RBC erythrocytes transport O_2 and CO_2 by hemoglobin
- WBC leucocytes (1%) linked to the immune system
- Platelets- responsible for blood clotting

Nov 4-6:58 AM

5) Cardiorespiratory Control

Cardiac Output
- is a combination of heart rate x stroke volume
- average resting cardiac output will vary from 4.8L/min to 6.4L/min 5L/min
- average adult body has 5L of blood, so this means that the equivalent of our entire volume of blood is pumped through our heart every minute
- During exercise Cardiac Output increase rapidly

w/ exercise ↑ 21 L/min

Stroke Volume
- the amount of blood which is ejected from the left ventricle with each contraction (about 70 ml)
- during exercise it increases until an athlete reaches 60% Max HR

140ml

Nov 5-7:25 AM

Heart Rate
- number of contractions of the heart per minute
- during exercise HR increases until about 60% VO_2

72 bpm

MHR= 220-age

Blood Pressure
- describes the pressure exerted on the vessel walls (arterial blood pressure).
- expressed in two numbers; the systolic(representing the highest pressure) and the diastolic (representing the lowest pressure)
- during exercise systolic bp increases but diastolic remains relatively unchanged

Ejection Fraction
- the amount of blood ejected from the left ventricle as a ratio of the blood in the left ventricle before systole
- during exercise the ejection fraction increases

Nov 5-7:48 AM

Blood Flow

- blood is shunted towards the skeletal muscles during exercise and away from the internal organs

Review p 133 before Monday

Nov 5-7:57 AM

6)

Cardiovascular Adaptations to Exercise

As we increase the intensity of physical demands on our bodies, our CV system adapts significantly to the increase in O_2 availability to our muscles.

Changes occur in 6 main areas;

- Heart Rate (HR)
- Stroke Volume (SV)
- Cardiac Output (CO)
- Blood Flow
- Blood Pressure (BP)
- The Blood

Nov 5-7:58 AM

Heart Rate

Resting Heart Rate is measured in beats per minute.
- average resting heart rate is 72 bpm
- with cardiovascular training the resting heart rate decreases

60s - good health
50s - highly trained
40s - elite

Nov 5-8:01 AM

Stroke Volume

Stroke volume of the heart can increase from 120ml per beat to 140ml in a moderately trained cardiovascular athlete.
Elite level nordic skiiers may have a stroke volume of 210 ml

AT Rest
5000 ml/min

72 x 70
50 x 100ml

Nov 5-8:02 AM

Cardiac Output (CO)

- Stroke Volume x Heart Rate

Resting = 5L/min
Max CO= 20-40 L/min depending on body size and endurance conditioning

Resting cardiac output remains unchanged but *max cardiac output* double at peak performance for elite level cardiovascular athletes

Nov 5-8:02 AM

Blood Flow

- Capillaries dilate (vasodilatation) in some areas and constrict (vasoconstrict) in others which redirects blood flow throughout the body

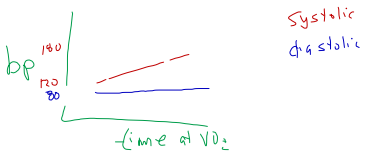
Relative Distribution of BF at Rest (approx.)

Regions of the Body	Rest (%)	Exercise(%
Cerebral	15	4
Myocardiac	5	6
Skeletal Muscle	20	70-85
Renal	20	2
Heptosplanchnic	10	13
Others	5	2

Nov 5-8:03 AM

Blood Pressure due to exercise onset

- BP increases with upper and lower body exercise



- Diastolic remains more consistent to resting values
- Systolic increases significantly

Aerobic Training -creates no change in systolic values

-decrease in diastolic pressure

Nov 5-8:03 AM

Blood

O_2 Content

- At Rest- 20ml of O_2 per 100ml of arterial blood
  14ml of O_2 per 100ml of venous blood

difference (6 ml) called the Arterial/Venous Oxygen Difference **(AVOD)**

- During Exercise- Arterial blood O_2 content increases slightly to 22-24ml per 100ml of blood
  Venous blood drops below 2-4ml O_2 per 100 ml of venous blood
- AVOD increases to 18-20ml O_2 uptake by the cells

Novice 20ml O_2 / 6ml O_2] 14

Elite 24ml O_2 / 2ml O_2] 22ml b/c ↑ Hg

Nov 5-8:05 AM

Plasma Volume

Plasma volume decreases almost immediately with the onset of exercise (10-20% reduction)

Plasma Reduction

- Due to the increase in blood pressure and pressure within the capillaries which force water out of the vascular compartments and into the interstitial compartments
- Thermo-concentration increases with decrease in plasma concentration (may lead to dehydration and overheating-heatstroke) ie Cory Stringer Minnesota Vikings
- Red Blood Cell concentration can increase by 20-25%

Nov 5-8:04 AM

Cardiovascular Changes and Air Pressure (Altitude)

High Pressure

- Underwater: increase in pressure decreases the size of Nitrogen and more of them fit into capillaries
- If a diver ascends too fast the N bubbles become larger again and block arteries and veins causing ischemia (loss of blood)
- Decompression Sickness (The Bends)
  Symptoms including nausea, vomiting and pain in joints
  Death can arise from popped capillaries and blood vessels

Nov 5-8:04 AM

7) Path of Blood in the Circulatory System

Worksheet

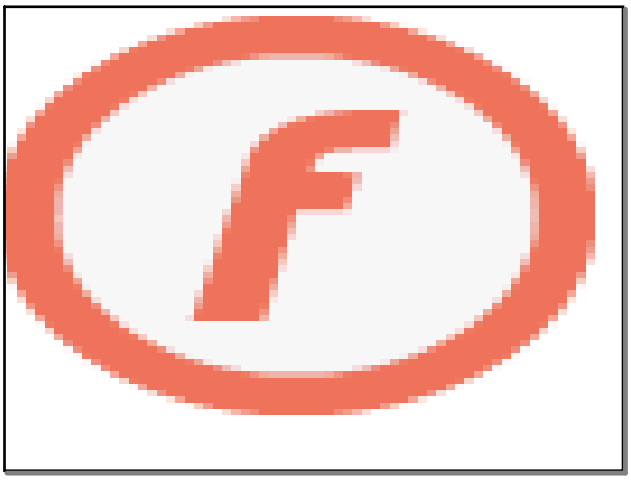
Nov 5-8:06 AM

From Body

1. Superior and Inferior Vena Cava
2. Right Atrium
3. Tricuspid Valve
4. Right Ventricle
5. Pulmonary Valve
6. Pulmonary Artery
7. Lungs
8. Pulmonary Vein
9. Left Atrium
10. Mitral (Bicuspid Valve)
11. Left Ventricle
12. Aortic Valve
13. Aorta

To Body

Nov 5-11:51 AM



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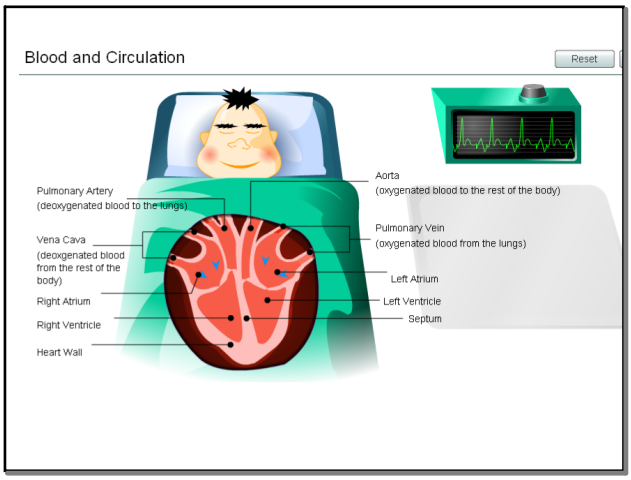

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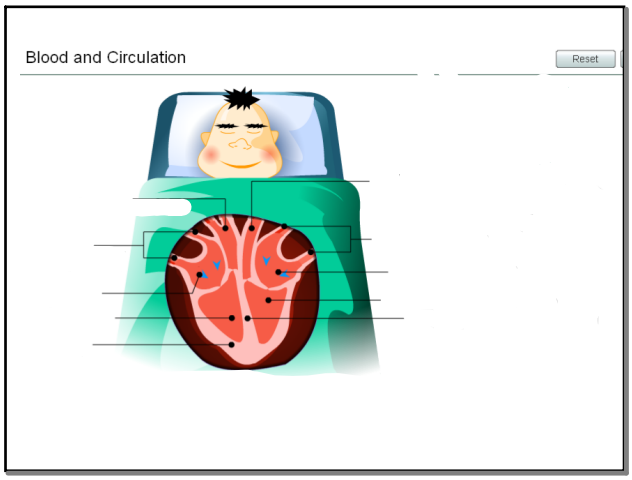

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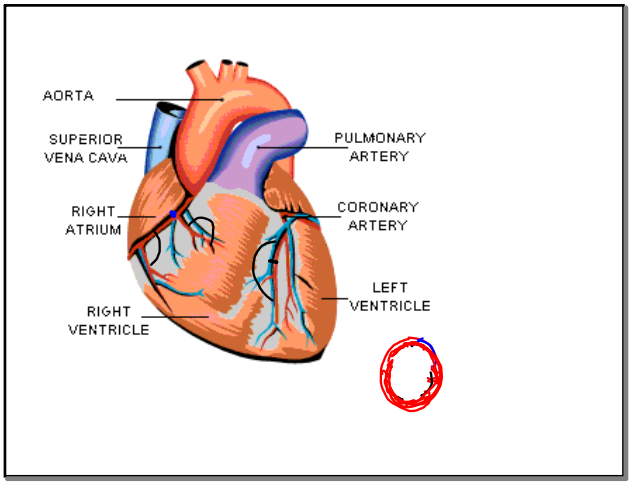

Nov 5-12:23 PM

1. Right Atrium
2. Left Atrium
3. Right Ventricle
4. Left Ventricle
5. Superior Vena Cava
6. Inferior Vena Cava
7. Aorta
8. Pulmonary Trunk
9. Right Pulmonary Artery
10. Left Pulmonary Artery
11. Right Pulmonary Veins
12. Left Pulmonary Veins
13. Coronary Arteries
14. Myocardium
15. Ligamentum Artriosum

Nov 5-12:22 PM

Oct 20-1:50 PM

Attachments

BLOOD PRESSURE - Liam.ppt